



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/770,289	01/29/2001	Atsushi Shiota	202450US0	6290
22850	7590	06/30/2004	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			FEELY, MICHAEL J	
			ART UNIT	PAPER NUMBER
			1712	

DATE MAILED: 06/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/770,289	SHIOTA ET AL.	
	Examiner	Art Unit	
	Michael J Feely	1712	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 07 April 2004.
- 2a) This action is **FINAL**. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-3,5-14 and 17-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 18 and 20 is/are rejected.
- 7) Claim(s) 1-3,5-14 and 17-20 is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner. Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a). Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>1003</u> . | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9 October 2003 has been entered.

Priority

2. Receipt is acknowledged of a certified copy of the Japanese application (JP 2000-23559) referred to in the oath or declaration or in an application data sheet. If this copy is being filed to obtain the benefits of the foreign filing date under 35 U.S.C. 119(a)-(d), applicant should also file a claim for such priority as required by 35 U.S.C. 119(b). If the application being examined is an original application filed under 35 U.S.C. 111(a) (other than a design application) on or after November 29, 2000, the claim for priority must be presented during the pendency of the application, and within the later of four months from the actual filing date of the application or sixteen months from the filing date of the prior foreign application. See 37 CFR 1.55(a)(1)(i). If the application being examined has entered the national stage from an international application filed on or after November 29, 2000, after compliance with 35 U.S.C. 371, the claim for priority must be made during the pendency of the application and within the time limit set forth in the PCT and Regulations of the PCT. See 37 CFR 1.55(a)(1)(ii). Any claim for priority under 35 U.S.C. 119(a)-(d) or (f) or 365(a) or (b) not presented within the time period set forth in 37 CFR 1.55(a)(1) is considered to have been waived. If a claim for foreign priority is presented after the

time period set forth in 37 CFR 1.55(a)(1), the claim may be accepted if the claim properly identifies the prior foreign application and is accompanied by a grantable petition to accept an unintentionally delayed claim for priority. See 37 CFR 1.55(c).

When originally filed, the instant case claimed foreign priority to Japanese Application JP 2000-023559. On 25 August 2003, a Supplemental Declaration was filed, wherein Japanese Applications JP 2000-23559 and JP 1999-188165 were listed as Prior Foreign Applications. However, priority was not claimed for either of these Japanese Applications. Based on this Supplemental Declaration, it is understood that a foreign priority claim no longer exists in the instant application.

Information Disclosure Statement

3. The information disclosure statement filed 9 October 2003 fails to fully comply with 37 CFR 1.98(a)(2), which requires a legible copy of each foreign patent; each publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been fully considered.

Item “AY” is listed as “Applied Materials’ assertion that Matthew Ross is a co-inventor of the 09/770,289 application.” A copy of the document cannot be found in the record of the instant application. Hence, it has not been considered.

Response to Amendment

4. The Declaration filed on 9 October 2003 under 37 CFR 1.131 is sufficient to overcome the Ross reference (US Pat. No. 6,204,201) – *previous rejection of claims 1-15 under 35 U.S.C.*

102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ross (US Pat. No. 6,204,201).

Pending Claims

5. Claims 1-3, 5-14, and 17-20 are pending.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claim 18 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Newly added claim 18 limits the process of claim 1 with, “wherein the film comprising at least one siloxane compound is applied directly on the semiconductor device by *chemical vapor deposition*. Applicant points to page 1 (line 1) and page 25 (lines 15-16) of the Specification for support:

The passage on page 1 is part of a discussion of the prior art. It simply states that a CVD method is commonly used to form silica films in semiconductor devices and other devices. However, the discussion of CVD has nothing to do with the instant invention. The discussion only pertains to the prior art.

The passage on page 25 discusses various coating techniques used in the instant invention. These include, “spin coating, dip coating, roll coating, and spraying.” There is no mention of a CVD method in this discussion.

Furthermore, a CVD method is not mentioned anywhere in the Specification when discussing the instant invention. Only wet coating methods are disclosed – *see: page 3, lines 15-19; page 13, lines 6-15; page 20, lines 2-4; page 23, lines 20-26; page 25, lines 15-23; and the Examples.*

Claim Objections

8. Claims 1-3, 5-14, and 17-20 are objected to because of the following informalities:

Claim 1: is drawn to, “a process for producing a silica-based film;” however, the current version of the claim is actually a method of coating a semiconductor device. The following language is suggested for the preamble: --A process for producing a silica-based film ***on a semiconductor device***--. Claims 2-3, 5-11, and 17-19 are objected to because they are dependent from claim 1.

Claim 12: is drawn to, “A silica-based film obtained by the product as claimed in claim 1;” however, claim 1 produces more than just a film. Claim 1 produces a silica-based film on a semiconductor device. The following language is suggested: --A silica-based film ***on a semiconductor device*** obtained by the process as claimed in claim 1.--

Claim 13: is drawn to, “A silica-based film as claimed in claim 12, which has a carbon content of from 5 to 17% by mole;” however, claim 12 is more than just a film. Claim 12 is a silica-based film on a semiconductor device. The following language is suggested: --The silica-

based film ***on a semiconductor device*** as claimed in claim 12, ***wherein the silica-based film*** has a carbon content of from 5 to 17% by mole.--

Claim 14: is drawn to, “A low-dielectric film comprising the silica-based film as claimed in claim 12;” however, claim 12 is more than just a film. Claim 12 is a silica-based film on a semiconductor device. The following language is suggested: --***The silica-based film on a semiconductor device as claimed in claim 12, wherein the silica-based film is a low-dielectric film.***--

Claim 20: is drawn to, “a process for producing a silica-based film;” however, the current version of the claim is actually a method of coating a substrate. The following language is suggested for the preamble: --A process for producing a silica-based film ***on a substrate***--.

Appropriate correction is required.

Claim Interpretation

9. The scope of claims 1-3, 5-14, and 17-20 has been interpreted based the suggested claim language, set forth above.

Claim Rejections - 35 USC § 102/103

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language;

or

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who

has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claim 20 is rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Chung (US Pat. No. 6,395,607).

Regarding claim 20, Chung discloses a process for producing a silica-based film *on a substrate* (column 3, lines 20-29), the process comprising:

- (1) providing a substrate comprising a material selected from the group consisting of Si, SiO₂ and SiN (column 3, lines 20-29);
- (2) applying directly on the substrate a film comprising at least one siloxane compound (column 3, lines 20-29; column 3, line 51 through column 5, line 47); and

(3) irradiating the film (column 6, lines 20-51) comprising at least one siloxane compound (column 3, line 51 through column 5, line 47) with electron beams at an irradiation dose of from 1 to 200 $\mu\text{C}/\text{cm}^2$ (column 6, lines 39-41), wherein the siloxane compound is a product obtained from at least one compound selected from the group consisting of:

- a) compounds represented by the following formula (1): $\text{R}^1\text{aSi}(\text{OR}^2)_{4-\text{a}}$ (1), where R^1 represents a monovalent organic group or a hydrogen atom; R^2 represents a monovalent organic group and a is an integer of 0 to 2 (column 3, line 51 through column 4, line 1), and
- b) compounds represented by the following formula (2): $\text{R}^3\text{b}(\text{R}^4\text{O})_{3-\text{a}}\text{Si}-(\text{R}^7)_{\text{d}}-\text{Si}(\text{OR}^5)_{3-\text{c}}\text{R}^6\text{c}$ (2), where R^3 , R^4 , R^5 , and R^6 may be the same or different and each is an integer of 0 to 2; R^7 represents an oxygen atom or a group represented by $-(\text{CH}_2)_{\text{n}}-$, where n is 1 to 6; and d is 0 or 1.

Chung does not explicitly disclose that their irradiation step, "thereby react(s) the siloxane compound throughout the film and convert(s) the siloxane film to form silicon carbide bonds represented by $\text{Si}-\text{C}-\text{Si}$ while maintaining the dielectric constant of the film at a value of 3 or lower." However, this is considered to be an inherent result of the electron beam treatment.

The electron-beam treatment would have inherently resulted in a re-ordering of atoms within the siloxane film, and subsequently, the dielectric constant of the film would have been maintained or altered. This inherent characteristic is supported by the disclosure of Chung. Chung teaches all of the starting materials and process parameters claimed in the instant invention. By using the same starting materials, the dielectric constant prior to electron-beam

treatment would have also been the same because a chemical composition and its properties are inseparable – *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

Furthermore, by providing the same process conditions, the effect on these starting materials, namely the reordering of atoms to provide Si-C-Si bonds, and the final properties of the treated materials, namely the dielectric constant, would have also been the same.

Regarding the electron beam dosage, Chung discloses, “The dose of electrons is preferably from about 1 to about 50,000 $\mu\text{C}/\text{cm}^2$ and more preferably from about 50 to about 20,000 $\mu\text{C}/\text{cm}^2$,” (column 6, lines 39-41). The “preferred range” of 1 to about 50,000 $\mu\text{C}/\text{cm}^2$ encompasses the claimed range; hence, a *prima facie* case of obviousness exists – *see MPEP 2144. 05: In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976). The “more preferred range” of about 50 to about 20,000 $\mu\text{C}/\text{cm}^2$ overlaps with the claimed range; hence the claimed range is anticipated if the prior art range discloses the claimed range with *sufficient specificity* – *see MPEP 2131.03*. The “most preferred range” appears to have *sufficient specificity* simply because it is a narrower range than the previously mentioned “preferred range”. This suggests that the overlapping portion of 50 to 200 $\mu\text{C}/\text{cm}^2$ has a higher level of significance in the teachings of Chung. However, if *sufficient specificity* is not exactly clear, Applicant has failed to show criticality for the claimed range, and it has been found that in the case where claimed ranges overlap or lie inside ranges disclosed in the prior art, a *prima facie* case of obviousness exists – *see MPEP 2144. 05: In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

Therefore, if the “most preferred range” of Chung were indeed sufficiently specific, Chung would have inherently anticipated the claims. In the alternative, if the “most preferred range” of Chung were not sufficiently specific, the range of 1-200 $\mu\text{C}/\text{cm}^2$ would have been an

obvious parameter in light of the overlapping “most preferred range” of Chung. Operating within this obvious range would have inherently resulted in a siloxane film converted to silicon carbide while maintaining a dielectric constant of 3 or lower.

Allowable Subject Matter

13. Claims 1-3, 5-14, 17, and 19 would be allowable if rewritten or amended to overcome the objection(s) set forth in this Office action.

14. Claim 18 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, first paragraph, set forth in this Office action.

15. The following is a statement of reasons for the indication of allowable subject matter: In claim 1, the silica-based film is *applied directly on a semiconductor device*. The closest prior art is Chung; however, the silica-based film in Chung is an *interlayer* of a semiconductor device (Abstract; column 3, lines 20-29). Chung provides no motivation to apply this film *on* a semiconductor device, wherein “device” is defined as, “an electronic element that cannot be divided without destroying its stated function.” Chung applies their *interlayer* directly to a semiconductor substrate; however, the substrate cannot be considered a *semiconductor device*; rather, it is part of a semiconductor device. Claims 2-3, 5-14, and 17-19 are allowable because they are dependent from claim 1.

It should be noted that prior art fails to teach the limitations of claim 18; however, claim 18 has been rejected for containing new matter. Amendment or cancellation of claim 18 is required to overcome this rejection.

Communication

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J Feely whose telephone number is 571-272-1086. The examiner can normally be reached on M-F 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasu Jagannathan can be reached on 571-272-1119. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Michael J. Feely
Patent Examiner
Art Unit 1712


Philip C. Tucker
Primary Examiner
Art Unit 1712